NOTES – *NOTISER*

The Age of the Torset Granite, Langöy, Northern Norway*

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The Torset Granite occurs on Langöy, one of the largest islands in the Lofoten-Vesterålen chain of northern Norway. The western two-thirds of Langöy is composed of granulite facies veined and banded gneisses containing minor intercalations of metasedimentary rocks (Heier 1960). The granulite facies terrain is separated from lower grade gneisses and schists to the east by a sharp metamorphic and, in some cases, tectonic boundary. In addition to irregular masses of monzonite, anorthosite and gabbro, large and small granite bodies (the 'young red granite' of Heier 1960), of which the Torset Granite is an example, occur exclusively in the granulite facies rocks.

Most of the rocks of the Lofoten-Vesterålen chain were originally assumed to have had a Paleozoic origin (Heier 1960). The arguments for a post-Caledonian origin for the Torset Granite seemed particularly compelling. It consists predominantly of alkali feldspar perthite and quartz, lesser plagioclase, and a small amount of biotite. The granite is massive and does not display any obvious metamorphic fabric; it is apparently post-kinematic. Langöy and the rest of the Lofoten-Vesterålen islands occur deep within the Caledonian orogenic system (Holtedahl & Dons 1960). It seems difficult to explain how a pre-Caledonian granite could maintain its non-foliate texture through the metamorphism and deformation that accompanied Caledonian orogeny.

K-Ar biotite ages from gneisses and schists on Langöy give ages of 423 to 575 m.y. (Broch 1964), apparently supporting a Caledonian origin for these rocks. However, Heier & Compston (1969) present Rb-Sr whole rock results indicating these gneisses had a much earlier origin, possibly as long as 2800 m.y. ago. Furthermore, their results indicate the 'young red granites' and associated monzonites, anorthosites and gabbros intruded during a period between 1700 to 1800 m.y. Specifically, five samples of 'young red granites' and three samples of retrograde gneisses on Langöy give an apparent Rb-Sr whole-rock isochron age of 1705 ± 45 m.y. (Model 3, McIntyre et al. 1966) and an initial Sr^{87}/Sr^{86} ratio of 0.7044 ± 0.0066. However, the scatter of their data was greater than that attributable to experimental error (mean square of weighted deviates, or MSWD, = 61.4, see McIntyre et al. 1966). Since the analyzed samples were from several separate bodies,

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it is possible to attribute this scatter to different initial Sr^{87}/Sr^{86} ratios of the granites and retrograde gneisses at their time of formation.

The pre-Caledonian age for apparently unmetamorphosed rocks from within the Caledonian tectonic province is puzzling and has considerable structural significance. It was therefore considered worthwhile investigating a suite of samples from a single granite body. Seven samples from the Torset Granite were analyzed using standard isotope-dilution techniques and a six-inch radius, 60° sector field, mass spectrometer equipped with a triple filament, thermionic source. Sr^{87}/Sr^{86} ratios were calculated from spike runs using Sr^{84} spike and normalizing Sr^{86}/Sr^{88} ratios to 0.1194. Isochrons were fitted to the data by the regression method of McIntyre et al. (1966). In this report, the variance in the Rb^{87}/Sr^{86} ratio is $26.30 \times 10^{-6} \times X^2$, and the variance for the calculated Sr^{87}/Sr^{86} ratio is 1.59×10^{-6}. The decay constant was taken to be $1.39 \times 10^{-11} yr^{-1}$. The results are listed in Table 1 and plotted in Figure 1.

Analyses of the data from all seven samples suggest the Model 2 isochron age of 1703 ± 80 m.y. and the initial Sr^{87}/Sr^{86} ratio of 0.7057 ± 0.0036 as the most appropriate, in excellent agreement with the results of Heier and Compston. The scatter of the data about the best-fit line, however, is still greater than that expected due to experimental error. Sample III (e) is quartz-free and somewhat gneissic in appearance and was collected near the contact of the intrusion; it may be a sample of country rock. It is clear from Figure 1 that this sample plays a large role in determining the initial ratio and slope of the isochron. Deleting it from the regression changes the Model 2 age to 1549 m.y. and the initial Sr^{87}/Sr^{86} ratio to 0.7183 and significantly decreases the precision of the determinations (Table 1).

Selecting samples from a single body apparently does not significantly

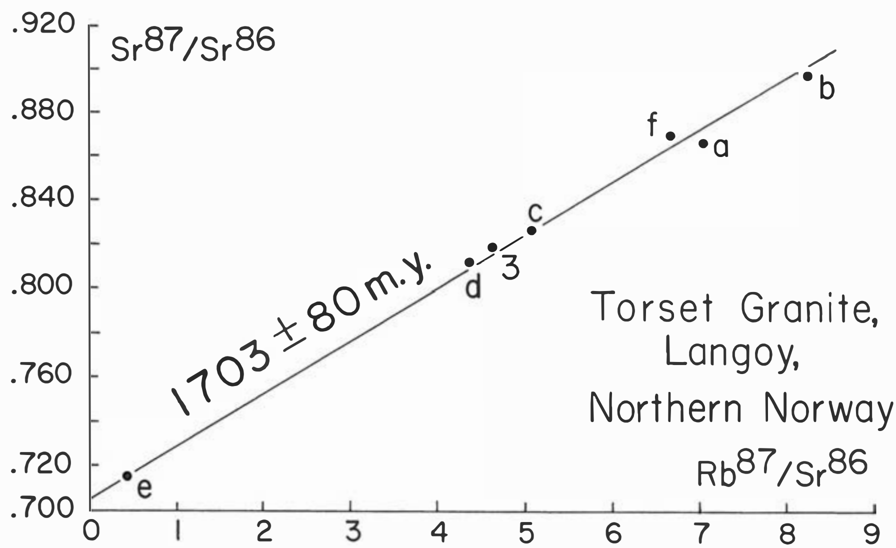

Fig. 1. Isochron plot of analytic results from the Torset Granite.

Table 1. Analytical data from the Torset Granite.

Sample Number	Rb (ppm)	Sr (ppm)	Rb^{87}/Sr^{86}	Sr^{87}/Sr^{86}
III (e)	77.6	532.	0.420	0.7154
III-3-d	89.7	59.7	4.37	0.8133
III-3	95.8	60.1	4.64	0.8198
III-3-c	81.5	46.8	5.07	0.8271
III-3-f	116.	51.1	6.66	0.8700
III-3-a	77.5	32.2	7.05	0.8659
III-3-b	97.6	34.7	8.24	0.8974

Isochron ages as estimated by alternative regression methods.

Regression	Model	Mean Square of Weighted Deviates	Age Estimate (m.y.)	Initial Sr^{87}/Sr^{86} Estimate
All	1	11.3	1665±40	0.7081±0.0031
Samples	2		1703±80	0.7057±0.0036
(7)	3		1653±150	0.7089±0.0116
As above	1	9.38	1550±80	0.7182±0.0071
less sample	2		1549±250	0.7183±0.0193
III (e)	3		1544±260	0.7187±0.0222

decrease the scatter of the data below that found by Heier & Compston for several bodies. The scatter could be the result of isotopic migration after initial crystallization, suggesting that the non-foliate, apparently undeformed, appearance of the Torset Granite is deceiving. In any case, the 1703 m.y. age is believed to be close to the true crystallization age of the granite; it is significant in that it demonstrates the extension of the Svecofennian basement complex of the Baltic Shield into the Caledonides as far as the west coast of Norway. The lack of an obvious Caledonian fabric within the Torset Granite and the rest of the Langöy rocks (Heier & Compston 1969) suggests the Lofoten-Vesterålen province was tectonically relatively high during the Caledonian Orogeny, and hence escaped the more severe aspects of Caledonian recrystallization and deformation.

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